**Supplemental Specification**
**2005 Standard Specification Book**

**SECTION 13557**

# VARIABLE MESSAGE SIGN AND SUPPORT

**Delete Section 13557 and replace with the following:**

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Install and test all Department furnished items including VMS sign assembly, VMS access platform, ATMS cabinet, and VMS controller.

B. Furnish, install, and test VMS support structures, sign connection hardware, catwalk, cabinet foundation, communications cable and any additional equipment required. Furnish all incidental items required to provide a complete cable connection between VMS controllers. Test the installed VMS and adjust the viewing angle as required.

### 1.2 RELATED SECTIONS

A. Section 01554: Traffic Control

B. Section 02466: Drilled Caisson

C. Section 03055: Portland Cement Concrete

D. Section 03211: Reinforcing Steel and Welded Wire

E. Section 03310: Structural Concrete

F. Section 05120: Structural Steel

G. Section 13551: General ATMS Requirements

H. Section 13554: Polymer Concrete Junction Box

I. Section 13555: ATMS Cabinet

J. Section 13595: ATMS Integration

## 1.3 REFERENCES

A. AASHTO M 31: Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

B. AASHTO M 232: Zinc (Hot-dip Galvanized) on Iron and Steel Hardware (nuts, washers, and anchor bolts)

C. AASHTO M 270: Carbon and High-Strength Low-Alloy Structural Steel Shapes, Plates, and Bars and Quenched and Tempered Alloy Structural Steel Plates for Bridges

D. AASHTO M 284: Epoxy Coated Reinforcing Bar

E. AASHTO M 291: Carbon and Alloy Steel Nuts

F. AASHTO M 293: Hardened Steel Washers

G. AASHTO M 314: Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

H. AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 4th Edition, 2001, with Interim

I. ASTM A 53: Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

J. ASTM A 123: Zinc (Hot-dip Galvanized) Coatings on Iron and Steel Hardware

K. ASTM A 307: Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

L. ASTM B 221: Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

M. ASTM B 308: Aluminum-Alloy 6061-T6 Standard Structural Profiles

N. ASTM B 429: Aluminum-Alloy Extruded Structural Pipe and Tube

O. ASTM F 593: Stainless Steel Bolts, Hex Cap Screws, and Studs

P. ANSI/AASHTO/AWS Structural Welding Code Specifications

## 1.4 SUBMITTALS

A. Mill Certificates for all structural steel. Refer to Section 05120.

B. Shop Drawings for all structure steel. Refer to Section 05120.

C. Provide all of the following submittals as described in Section 13551:
   1. Contractor Furnished Material and Equipment Lists
   2. Test Reports for the Cable & Conductor Test, the Local Field Operations Test, and the Thirty-Day Burn-In Test
   3. Completion Notice
   4. Compliance Certificate
   5. Manufacturer's Equipment Documentation
   6. As-Built Drawings

D. Provide item number and name on all materials certificates.

# PART 2 PRODUCTS

## 2.1 VMS FOUNDATIONS

A. Concrete: Class AA(AE) required. Refer to Sections 03055 and 03310.

B. Reinforcing Steel: Use coated deformed billet-steel bars in accordance with AASHTO M 284 or ASTM A 123 and AASHTO M 31 Grade 60. Refer to Section 03211.

C. Anchor Bolts:
   1. In accordance with AASHTO M 314 Grade 36. Refer to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, Section 5.17.
   2. Thread the anchor bolts where shown and allow free running nuts, by hand, for the entire length.
   3. Galvanize the anchor bolts, all nuts and washers, in accordance with AASHTO M 232.
   4. Do not weld anchor bolts to reinforcing steel.
   5. Nuts: Use AASHTO M 291 Specifications.
   6. Washers: Use AASHTO M 293 Specifications.

## 2.2 JUNCTION BOX

A. Refer to Section 13554.

## 2.3 VMS SUPPORTS

A. Structural Steel: General
   1. Hot-dip galvanize all structural steel after fabrication in accordance with ASTM A 123. Structural steel may be metallized using electric arc sprayed zinc wire as an alternative.
   2. Welding: In accordance with the ANSI/AASHTO/AWS D1.1 Specifications.
   3. Galvanize all bolts, nuts, and washers in accordance with AASHTO M 232.
   4. Charpy V-Notch tests are required for all main load carrying tension members with a ½-inch steel thickness or greater. Test results must meet requirements for zone 2.

B. Structural Pipe:
   1. Use low carbon steel conforming to ASTM A 53 Grade B, except use chemical composition requirements of: carbon ≤ 0.25 percent, phosphorus ≤ 0.04 percent, manganese ≤ 1.35 percent, and silicon ≤ 0.05 percent. Use ASTM A 53 Grade B for other elements.
   2. Bolts, nuts, and washers: Refer to Section 05120.

C. All Other Structural Steel:
   1. All other shapes and plates: Use AASHTO M 270 Grade 36.
   2. Bolts: Use ASTM A 307.
   3. Stainless Steel Bolts: Use ASTM F 593 Type 304.
   4. Nuts: Use AASHTO M 291.
   5. Washers: Use AASHTO M 293. Use lock washers on all bolts.
   6. Galvanize entire sign assembly with mounting brackets: ASTM A 123.

## 2.4 VMS CATWALK

A. Aluminum: General
   1. Use 6061-T6 aluminum in accordance with:
      a. ASTM B 308 for I-beams, H-beams, channels, angles, tees, and zees.
      b. ASTM B 429 for pipe and tube.
   2. Grating: Use 5052 H32 aluminum expanded metal conforming to ASTM B 221 with the size shown in the contract.

3. Welding: In accordance with the ANSI/AASHTO/AWS D1.2 Specifications.

## PART 3 EXECUTION

### 3.1 PREPARATION

A. Load, transport, and install all state-furnished materials per the manufacturer's instructions and as shown in the contract.

B. Provide foundations, VMS supports, junction boxes, ground rod, grounding lug, conduit, and all additional miscellaneous items required for a complete and operational VMS.

C. Install all wiring, conduit, and junction boxes as shown in the contract.
1. Field locate all conduit and junction boxes to avoid drainage areas and steep slopes whenever possible.
2. Protect existing conductors while installing cables and conductors.
3. Install surge suppressors at the VMS Sign Controller and ATMS Cabinet. Minimum specifications for surge suppressors are as follows:
   a. Protects Pairs 1-8
   b. Protects all Pins (8)
   c. Maximum Surge of 100 mA
   d. Turn on at 10 mA
   e. Typical Capacitance of 55 pF
   f. Series Resistance less than 0.02 Ω
   g 0 to 100 percent Humidity
   h. Operates in -40 degrees F (-40 degrees C) to 185 degrees F (85 degrees C) Temperatures

D. Furnish and install all incidental items, such as wire nuts, grommets, tape connectors, and electrical nuts, necessary to make the VMS system complete.

E. After installation, the exterior of all equipment must be free of all loose rust and mill scale, dirt, oil, grease and other foreign substances.

F. Restore work area to the original condition or better after work is completed.

### 3.2 CONSTRUCTION SEQUENCE

A. Deploy traffic control devices and/or personnel. Refer to Section 01554.

B. Fabricate structural supports and catwalk. Construct foundations, establishing base plate elevations in accordance with project plans. Obtain Engineer's approval for all dimension changes.

C. Survey the constructed base plate locations, have the Engineer approve their layout before erecting the sign structure, fit the structure to the foundations' anchor bolts, and meet vertical clearance requirements.

D. Remove shipping supports and connect all wiring and cables in a neat and orderly fashion, verify all parts are properly seated and functional and make final adjustments to sign horizontal and vertical angles. Orient the VMS sign perpendicular to the viewing angle of motorists 800 feet before the sign. The Engineer may order adjustments to the sign angle during the initial installation.

## 3.3 VMS FOUNDATIONS

A. Excavation
   1. Perform as described in Sections 02466 and 13551.

B. Anchor Bolts:
   1. Provide anchor bolt template during installation of anchor bolts. Fabricate the bolt template of ¼ -inch thick minimum steel plate, similar to anchor plate details. Match drill to each base plate.
   2. Fill the void between the base plate and top of foundation with non-shrink grout after completing the sign erection.

C. Earthwork
   1. Place compacted embankments prior to drilling.
   2. Form caissons to a minimum of 6 inch below the ground surface. Refer to Section 02466. Place compacted backfill before erecting post.

## 3.4 VMS SUPPORTS

A. Structural Pipe:
   1. Provide hand holes for the overhead pipe frame on one side only.
   2. Locate inserts at the bottom of the mast arm . Weld 1 ½ -inch diameter insert in each hole. Thread inserts before galvanizing and provide galvanized plugs.
   3. Rake post as necessary during sign erection using leveling nuts to level the sign panels. At final position, create a snug tight condition by wrench tightening both top and bottom anchor bolt nuts against the base plate until full contact is made. Tighten top nuts one-sixth turn past snug tight and retighten lower nuts to maintain full contact.

B. All Other Structural Steel:
   1. Use one sign-mounting bracket at each sign support. See sign fabricator's drawings for number and location of supports (i.e., channels or Z-bracket).
   2. Pre-tension steel rod to 11,000 lbf.
   3. Sign placement on horizontal member may be adjusted up to $^{3}/_{8}$ inch upward for VMS platform to match catwalk elevation.

C. Earthwork:
   1. Place and compact backfill prior to erecting supports.

## 3.5 ATMS CABINET

A. Install ATMS cabinet according to Section 13555.

## 3.6 TESTING AND ACCEPTANCE

A. Successfully complete the following tests:
   1. Cable and Conductor Test: Obtain UDOT's newest version of the ATMS Cable and Conductor Test from the UDOT Web site. Refer to http://www.udot.utah.gov/index.php/m=c/tid=719.
   2. Local Field Operations Test: Obtain UDOT's newest version of the Variable Message Sign Local Field Operations Test form from the UDOT Web site. Refer to http://www.udot.utah.gov/index.php/m=c/tid=719.
      a. Conduct the Local Field Operations test after the Cable and Conductor test has been successfully completed and the Cable and Conductor Test Report has been approved by the Engineer.
      b. Verify physical construction has been completed in accordance with the plans and specifications and that the connecting cabling has been properly installed.
      c. Furnish all equipment, appliances, and labor necessary for the test.
   3. Acceptance Tests: Refer to Section 13595.

END OF SECTION